

WHAT IS CLAIMED IS:

- 1 1. An electric motor apparatus, comprising:
 - 2 a housing;
 - 3 a rotatable axle, wherein the rotatable axle is maintained in a fixed
 - 4 axial position relative to the housing by bushings, and wherein the bushings are
 - 5 coupled to the housing;
 - 6 a commutator coupled to the rotatable axle and disposed substantially
 - 7 around the rotatable axle, wherein the commutator comprises multiple electrically
 - 8 conductive segments;
 - 9 a first field armature, wherein the first field armature comprises a
 - 10 plurality of first field magnets spaced around the first field armature, wherein the
 - 11 first field armature is disposed substantially around the axle, and wherein the first
 - 12 field armature is coupled to the axle;
 - 13 a second field armature, wherein the second field armature comprises
 - 14 a plurality of second field magnets spaced around the second field armature, wherein
 - 15 the second field armature is disposed substantially around the first field armature,
 - 16 and wherein the second field armature is coupled to the axle;
 - 17 an electromagnetic member, wherein the electromagnetic member
 - 18 comprises a plurality of electromagnets spaced around the electromagnetic member,
 - 19 wherein each electromagnet comprises a winding that is electrically coupled to an
 - 20 appropriate segment of the commutator, wherein the electromagnetic member is
 - 21 disposed between the first field armature and the second field armature, such that the
 - 22 first field armature is disposed substantially inside the electromagnetic member and
 - 23 the second field armature is disposed substantially outside the electromagnetic
 - 24 member, and wherein the electromagnetic member is coupled to the housing; and
 - 25 wherein each winding is electrically coupled to an appropriate
 - 26 segment of the commutator such that each winding is capable of being sequentially

27 electrically coupled to a current source that is capable of supplying an effective
28 amount of current to the electric motor, such that, when the axle rotates, at least one
29 appropriate segment of the commutator is in sequential electrical contact with the
30 current source and an appropriate current is sequentially provided to each winding.

1 2. The apparatus of claim 1, wherein the field magnets comprise iron
2 core magnets.

1 3. The apparatus of claim 1, wherein the first field armature comprises
2 eight first field magnets.

1 4. The apparatus of claim 1, wherein the bushings comprise ball
2 bearings, magnetic bearings, Teflon, or an equivalent.

1 5. The apparatus of claim 1, wherein the second field armature
2 comprises eight second field magnets.

1 6. The apparatus of claim 1, wherein the first field armature forms a
2 substantially concentric circle around the axle.

1 7. The apparatus of claim 1, wherein the second field armature forms
2 substantially concentric circle around the first field armature.

1 8. The apparatus of claim 1, wherein the number of electromagnets
2 corresponds to the number of field magnets included in the first field armature.

1 9. The apparatus of claim 1, wherein each winding is electrically
2 coupled to an appropriate segment of the commutator via at least one brush.

1 10. The apparatus of claim 1, comprising:
2 a third field armature, wherein the third field armature comprises a
3 plurality of third field magnets spaced around the third field armature, wherein the
4 third field armature is disposed substantially around the second field armature, and
5 wherein the third field armature is coupled to the axle;

6 a second electromagnetic member, wherein the second
7 electromagnetic member comprises a plurality of second electromagnets spaced
8 around the second electromagnetic member, wherein each second electromagnet

9 comprises a winding that is electrically coupled to an appropriate segment of the
10 commutator, wherein the second electromagnetic member is disposed between the
11 second field armature and the third field armature, such that the second field
12 armature is disposed substantially inside the second electromagnetic member and
13 the third field armature is disposed substantially outside the second electromagnetic
14 member, and wherein the second electromagnetic member is coupled to the housing.

1 11. The apparatus of claim 10, wherein the plurality of second field
2 magnets comprises a plurality of inner second field magnets disposed substantially
3 along an inner side of the second field armature and a plurality of outer second field
4 magnets disposed substantially along an outer side of the second field armature.

1 12. The apparatus of claim 1, comprising multiple additional field
2 armatures and electromagnetic members, wherein each field armature is coupled to
3 the axle of the electric motor and each electromagnetic member is coupled to the
4 housing.

1 13. An electric motor apparatus, comprising:

2 a housing;

3 a rotatable axle, wherein the rotatable axle is maintained in a fixed
4 axial position relative to the housing by bushings, and wherein the bushings are
5 secured to the housing;

6 a first field armature, wherein the first field armature comprises a
7 plurality of first field magnets spaced around the first field armature, wherein the
8 first field armature is disposed substantially around the axle, and wherein the first
9 field armature is secured to the axle;

10 a second field armature, wherein the second field armature comprises
11 a plurality of second field magnets spaced around the second field armature, wherein
12 the second field armature is disposed substantially around the first field armature,
13 and wherein the second field armature is secured to the axle;

14 an electromagnetic member, wherein the electromagnetic member
15 comprises a plurality of electromagnets spaced around the electromagnetic member,
16 wherein each electromagnet comprises a winding that is electrically coupled to an
17 appropriate current source, wherein the electromagnetic member is disposed
18 between the first field armature and the second field armature, and wherein the
19 electromagnetic member is secured to the housing; and

20 wherein each winding is capable of being sequentially electrically
21 coupled to a current source, such that an appropriate current may be sequentially
22 provided to each winding.

1 14. The apparatus of claim 13, wherein the current source is capable of
2 supplying an effective amount of current to the electric motor.

1 15. The apparatus of claim 13, comprising multiple additional field
2 armatures and electromagnetic members, wherein each field armature comprises a
3 plurality of field magnets spaced around each respective field armature, wherein
4 each field armature is secured to the axle, wherein each electromagnetic member
5 comprises a plurality of electromagnets spaced around each respective
6 electromagnetic member, wherein each electromagnet comprises a winding that is
7 electrically coupled to an appropriate current source, and wherein the
8 electromagnetic member is secured to the housing.